

Application No. 10/812,765
Response to Office Action

Customer No. 01933

Listing of Claims:

1. (Currently Amended) A liquid crystal display device comprising:

(i) a liquid crystal element which includes comprising:

5 a front substrate which is arranged at a front side of the liquid crystal element, which corresponds to a viewing screen side of the display device; from where a screen is viewed;

a back substrate which is arranged at a back side of said front substrate so as to be opposed to said front substrate;
[[,]]

10 at least one first electrode which is formed on one of an internal surface of said front substrate, and which is opposed to an internal surface of said back substrate; the internal surfaces being opposed to each other,

15 at least one thin film transistor which is arranged on the internal surface of said back substrate and driven by a drive signal;

20 at least one second electrode which is arranged on the other of the internal surfaces opposed to each other internal surface of said back substrate so as to be opposed to said at least one first electrode, and which is connected to said thin film transistor, thereby forming at least one pixel in a region that does not overlap with a region where the thin film

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25 transistor is formed and that is included in an area where said at least one first electrode and said at least one second electrode are opposed to each other; [,]

a liquid crystal layer which is sandwiched between said front substrate and said back substrate; [,]

30 at least one reflective film which is provided at a back of side of said back substrate with respect to said liquid crystal layer so as to correspond to a part of said region in which said at least one pixel is formed that does not overlap with the region where the thin film transistor is formed, such that a reflective portion for reflecting an incident light and a transmissive portion, which is in a region other than said reflective portion, and through which an for transmitting incident light permeates are formed in said at least one pixel; [,]

40 a color filter which is provided on one of the internal surfaces opposed to each other surface of the front substrate and the internal surface of the back substrate so as to correspond to said at least one pixel, and which has an opening formed by removing said color filter at a position such that said opening corresponds to a part of said reflective portion, which is in said region that does not overlap the region where said thin film transistor is formed; and

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a liquid crystal layer thickness adjusting layer which is provided ~~on in~~ at least a region corresponding to said reflective portion between said front substrate and said back substrate, in order to ~~adjust set~~ a thickness of said liquid crystal layer in said reflective portion with respect to a thickness of said liquid crystal layer in said transmissive portion in accordance with a thickness of said color filter ~~to be thinner than a thickness of said liquid crystal layer in said transmissive portion;~~

50 55 (ii) a front polarizing plate and a back polarizing plate which are arranged at ~~a~~ the front side and a back side of said liquid crystal element, respectively; and
(iii) a backlight which is arranged at a back of said back polarizing plate.

2. (Withdrawn - Currently Amended) The liquid crystal display device according to claim 1, wherein a thickness of said liquid crystal layer thickness adjusting layer is set such that a thickness of said color filter in said reflective portion is thinner than a thickness of said color filter in said transmissive portion, ~~and the thickness of said liquid crystal layer in said reflective portion is thinner than the thickness of said liquid crystal layer in said transmissive portion.~~

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3. (Currently Amended) The liquid crystal display device according to claim 1, wherein a thickness of said liquid crystal layer thickness adjusting layer is set such that a thickness of said color filter in said reflective portion is equal to a thickness of said color filter in said transmissive portion, and the thickness of said liquid crystal layer in said reflective portion is thinner than the thickness of said liquid crystal layer in said transmissive portion.

4. (Withdrawn - Currently Amended) The liquid crystal display device according to claim 1, wherein a thickness of said liquid crystal layer thickness adjusting layer is set such that a thickness of said color filter in said reflective portion is thinner than a thickness of said color filter in said transmissive portion, and the thickness of said liquid crystal layer in said reflective portion is equal to the thickness of said liquid crystal layer in said transmissive portion.

5. (Withdrawn - Currently Amended) The liquid crystal display device according to claim 4, further comprising a flattening film which is formed on said color filter in order to flatten a surface of said color filter, which has having different thicknesses.

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6. (Withdrawn) The liquid crystal display device according to claim 4, wherein said liquid crystal element is an STN (Super Twisted Nematic) liquid crystal display element.

7. (Original) The liquid crystal display device according to claim 1, wherein said liquid crystal element comprises a homogeneous liquid crystal layer in which liquid crystal molecules are oriented substantially in parallel with surfaces of 5 a pair of substrates without being twisted between the substrates in a non electric field state where no electric field is applied.

8. (Currently Amended) The liquid crystal display device according to claim 1, wherein said liquid crystal layer thickness adjusting layer ~~is made of~~ comprises a transparent insulation film.

Claim 9 (Canceled).

10. (Currently Amended) The liquid crystal display device according to claim 1 ~~9~~, wherein said liquid crystal layer thickness adjusting layer fills said hole formed in said color filter.

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11. (Currently Amended) The liquid crystal display device according to claim 1 or, wherein said liquid crystal layer thickness adjusting layer is formed so as to fill fills said hole formed in said color filter and to cover covers said color filter.

12. (Withdrawn) The liquid crystal display device according to claim 1, wherein:

said liquid crystal layer thickness adjusting layer is formed on a surface of one of said front substrate and said back substrate; and

5 said color filter is formed such that a part of said color filter covers said liquid crystal layer thickness adjusting layer.

13. (Currently Amended) The liquid crystal display device according to claim 1, wherein said reflective layer has comprises a reflective surface on which depressions and protrusions are formed.

14. (Currently Amended) The liquid crystal display device according to claim 1, wherein:

a value of a product $\Delta n \cdot d_1$ of a thickness d_1 and a refractive index anisotropy Δn of said liquid crystal layer in

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5 said reflective portion is set to a value which makes said liquid crystal layer provide a retardation of 1/4 wavelength to a transmitting light transmitted therethough in a non electric field state in which substantially no electric field is applied between the first and second electrodes opposed to each other;

10 and

a value of a product $\Delta n \cdot d_2$ of a thickness d_2 and a refractive index anisotropy Δn of said liquid crystal layer in said transmissive portion is set to a value that makes said liquid crystal layer provide a retardation of 1/2 wavelength to a transmitting light transmitted therethrough in the non electric field state.

15. (Currently Amended) The liquid crystal display device according to claim 14, further comprising a front retardation plate and a back retardation plate which are respectively arranged between said front polarizing plate and said liquid crystal layer and between said back polarizing plate and said liquid crystal layer such that their slow axes thereof are orthogonal to each other, and which provide a retardation of 1/4 wavelength to a transmitting light [[,] transmitted therethrough;

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10 wherein [[:]] said front polarizing plate and said back polarizing plate are arranged such that their the transmission axes thereof are orthogonal to each other; and
wherein said front retardation plate is arranged so as to cancel the retardation provided to the transmitting light
15 transmitted therethrough by said liquid crystal layer in the non electric field state.

16. (Currently Amended) The liquid crystal display device according to claim 15, further comprising a scattering reflective plate which is arranged between said front polarizing plate and said liquid crystal layer and which scatters a transmitting portion of light incident thereon.

17. (Currently Amended) A liquid crystal display device comprising:

(i) a liquid crystal element which includes comprising:
a front substrate which is arranged at a front side of the liquid crystal element, which corresponds to a viewing screen side of the display device; from where a screen is viewed,
5 a back substrate which is arranged at a back side of said front substrate so as to be opposed to said front substrate;
[[,]]

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10 at least one opposite electrode which is formed on an internal surface of said front substrate; ~~that is opposed to said back substrate,~~

15 a plurality of thin film transistors which are arranged on an internal surface of said back substrate and which are driven by a drive signal;

20 a plurality of pixel electrodes which are arranged on ~~an~~ the internal surface of said back substrate ~~that is opposed to said front substrate~~ so as to be opposed to said at least one opposite electrode, and which are connected to said thin film transistors, thereby forming a plurality of pixels in areas where said at least one opposite electrode and said plurality of pixel electrodes are opposed to each other; [,]

a liquid crystal layer which is sandwiched between said front substrate and said back substrate; [,]

25 a plurality of reflective films which are provided on the internal surface of said back substrate so as to respectively correspond to parts of regions, in which said plurality of pixels are formed and which do not overlap with regions where said thin film transistors are formed, such that a reflective portion for reflecting an incident light and a transmissive portion, which is in a region other than said reflective portion, and through which an for transmitting incident light permeates are formed in each of said plurality of pixels; [,]

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a color filter which is provided on the internal
35 surface of said front substrate that is opposed to said back
substrate, so as to correspond to said plurality of pixels, and
liquid crystal layer thickness adjusting layers which
are provided ~~on~~ in regions corresponding to at least said
reflective portions on said color filter, ~~formed on the internal~~
40 ~~surface of said front substrate that is opposed to said back~~
substrate, in order to make set a thickness of said liquid
crystal layer in said reflective portions to be thinner than a
thickness of said liquid crystal layer in said transmissive
portions;

45 (iii) a front polarizing plate and a back polarizing plate
which are arranged at ~~a~~ the front side and a back side of said
liquid crystal element, respectively; and
(iii) a backlight which is arranged at a back of said back
polarizing plate.

18. (Currently Amended) The liquid crystal display device
according to claim 17, wherein:

thicknesses of said respective liquid crystal layer
thickness adjusting layers are set such that a thickness of said
5 color filter in said reflective portions is equal to a thickness
of said color filter in said transmissive portions; and the
~~thickness of said liquid crystal layer in said reflective~~

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~~portions is thinner than the thickness of said liquid crystal layer in said transmissive portion;~~

10 said color filter has holes formed by removing parts of said color filter [[,] at portions corresponding to said reflective portions of said plurality of pixels; and

 said liquid crystal layer thickness adjusting layers are formed so as to fill said holes formed in said color filter and
15 to cover said color filter.

Claims 19 and 20 (Canceled).